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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Customer No.:	23643
Group:	3749
Confirmation No.:	3387
Application No.:	10/719,423
Invention:	METHOD OF MIXING HIGH TEMPERATURE GASES IN MINERAL PROCESSING KILNS
Applicant:	Eric R. Hansen et al.
Filed:	November 21, 2003
Attorney Docket:	204560-73806
Examiner:	Jiping Lu

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SECOND AMENDED APPEAL BRIEF

Mail Stop Appeal Brief-Patents
Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

Sir:

This Amended Appeal Brief is being resubmitted electronically in support of the appeal from the Primary Examiner's November 29, 2006 fifth rejection of claims 1-29 and 31-34. This Appeal Brief was originally submitted on June 28, 2007, and then resubmitted on July 31, 2007. The Patent Appeal Center Specialist rejected the 7/31/07 Amended Appeal Brief alleging it to be defective for failing to map each of the independent claims to the specification. To the contrary, the 7/31/07

Amended Appeal Brief did indeed map the independent claims by use of both reference numerals and specific citations to page numbers, example numbers, and/or figure numbers. However, in an effort to facilitate prosecution of this application, additional references have been added to the claim summaries herein. Moreover, to facilitate review by the Patent Appeal Center Specialist, citations to the specification have been italicized.

Because Appellants have previously petitioned the Commissioner to extend the time to file this Appeal Brief for one month from May 29, 2007 to June 29, 2007, and because this is a reinstatement of an appeal not acted on by the Board of Appeals as a result of prosecution being reopened by the Primary Examiner, it is believed that no additional fees are due in regard to the filing of this Amended Appeal Brief. Please charge any additional fees or credit any overpayments to Deposit Account No. 10-0435, with reference to our file number 204560-73806.

REAL PARTY IN INTEREST

The real parties in interest are Cadence Environmental Energy, Inc. and Ash Grove Cement Company, the assignees, pursuant to assignments recorded in the records of the U. S. Patent and Trademark Office at (1) reel 014493, beginning at frame 0720, (2) reel 014493, beginning at frame 0678, and (3) reel 014538, beginning at frame 0145.

RELATED APPEALS AND INTERFERENCES

There are no other appeals or interferences known to Appellants that will directly affect or be directly affected by, or have a bearing on the Board's decision in the present appeal.

STATUS OF CLAIMS

Claims 1-29 and 31-34 are pending in this application.

Claim 30 was cancelled in the Response to Office Action dated November 30, 2004.

Claims 1-29 and 31-34 were rejected in the Office Action dated November 29, 2006.

Each of claims 1-29 and 31-34 is appealed.

A copy of pending claims 1-29 and 31-34 is attached hereto in an Appendix.

STATUS OF AMENDMENTS

No amendments have been made to the claims subsequent to the November 29, 2006 rejection.

SUMMARY OF CLAIMED SUBJECT MATTER

Independent Claim 1:

Claim 1 is directed to a method of operating a mineral processing kiln (10) having an inclined rotary vessel (12). *See, e.g. FIG. 10b.* The method includes the step of introducing combustion air and combustible fuel in a sub-stoichiometric ratio through a lower end of the rotary vessel (12), and introducing additional combustion air through an opening in a wall of the rotary vessel (12) at a location between the lower end of the rotary vessel (12) and an upper end of the rotary vessel (12). *The method of claim 1 is shown diagrammatically, along with a stoichiometric illustration, in FIG. 10b. Example 1, as described in the passage spanning line 25 of page 14 through line 20 of page 15 of the specification, also facilitates an understanding of claim 1.*

Independent Claim 7:

Claim 7 is directed to a method of operating a lime kiln (10) having an inclined rotary vessel (12). *See, e.g. FIG. 10b.* The method includes the steps of advancing lime mineral from an upper end of the inclined rotary vessel (12) to a lower end of the inclined rotary vessel (12), introducing combustion air and combustible fuel in a sub-stoichiometric ratio through the lower end of the rotary vessel (12), and introducing additional combustion air through an opening in a wall of the rotary vessel (12) at a location between the lower end of the rotary vessel and the upper end of the rotary vessel. *The method of claim 7 is shown diagrammatically, along with a stoichiometric illustration, in FIG. 10b. Example 1, as described in the passage spanning line 25 of page 14 through line 20 of page 15 of the specification, also facilitates an understanding of claim 7.*

Independent Claim 14:

Claim 14 is directed to a method of controlling the air/fuel stoichiometry in a mineral processing kiln (10). *See, e.g. FIG. 10b.* The method includes the steps of advancing a combustible fuel into a lower end of a rotary vessel (12) of the mineral processing kiln (10), advancing a first

quantity of combustion air into the lower end of the rotary vessel (12) to create sub-stoichiometric conditions in the lower end of the rotary vessel (12), and advancing a second quantity of combustion air into the rotary vessel (12), at a location between the lower end of the rotary vessel (12) and an upper end of the rotary vessel (12), to create super-stoichiometric conditions in a mid-portion of the rotary vessel (12). *The method of claim 14 is shown diagrammatically, along with a stoichiometric illustration, in FIG. 10b. Example 1, as described in the passage spanning line 25 of page 14 through line 20 of page 15 of the specification, also facilitates an understanding of claim 14.*

Independent Claim 19:

Claim 19 is directed to a method of operating a preheater/precalciner kiln (10) having an inclined rotary vessel (12). The method includes the steps of advancing mineral from a preheater/precaliner assembly *(see, e.g., FIGS. 17-20 for exemplary preheater/precalciner assemblies)* into an upper end of the inclined rotary vessel (12), advancing mineral from the upper end of the rotary vessel (12) to a lower end of the inclined rotary vessel (12), introducing a first quantity of combustion air and combustible fuel through the lower end of the rotary vessel (12), and introducing a second quantity of combustion air through an opening in a wall of the rotary vessel (12) at a location between the lower end of the rotary vessel (12) and the upper end of the rotary vessel (12). *The method of claim 14 is shown diagrammatically, along with a stoichiometric illustration, in FIG. 10b. Example 4, as described in the passage spanning line 19 on page 16 through line 10 of on page 17 of the specification, also facilitates an understanding of claim 19.*

Independent Claim 26:

Claim 26 is directed to a mineral processing kiln (10) including an inclined rotary vessel (12) having a lower end and an upper end. The rotary vessel having an air inlet opening defined therein at a location between the upper end and the lower end thereof (see FIG. 10b). A preheating/precalcining assembly *(see, e.g., FIGS. 17-20 for exemplary preheater/precalciner assemblies)* is positioned proximate to the upper end of the rotary vessel (12). The preheating/precalcining assembly includes a stationary vessel through which: (i) mineral passes prior to advancement into the rotary vessel (12), and (ii) a kiln gas stream passes in contact with the mineral subsequent to advancement out of the rotary vessel. A stationary hood (28) is positioned

proximate to the lower end of the rotary vessel (12), and a burner (24) is positioned proximate to the lower end of the rotary vessel (12) *(see FIGS. 10b and 17-20). Example 4, as described in the passage spanning line 19 on page 16 through line 10 of on page 17 of the specification, also facilitates an understanding of claim 19.*

Independent Claim 31:

Claim 31 is directed to a lime kiln (10) including an inclined rotary vessel (12) having a lower end and an upper end. The rotary vessel has an air inlet opening defined therein at a location between the upper end and the lower end thereof *(see FIG. 10b)*. The lime kiln also has a mineral feed assembly operable to heat lime mineral by contact with a kiln gas stream advancing therethrough and thereafter advance the lime mineral into the upper end of the rotary vessel *(see FIGS. 17-20)*, a stationary hood (28) positioned proximate to the lower end of the rotary vessel (12), and a burner (24) positioned proximate to the lower end of the rotary vessel (12). *(see FIGS. 10b and 17-20). Example 1, as described in the passage spanning line 25 of page 14 through line 20 of page 15 of the specification,* and *Example 4, as described in the passage spanning line 19 on page 16 through line 10 of on page 17 of the specification, also facilitate an understanding of claim 31.*

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The following four grounds of rejection are presented for review:

(1) the rejection of claims 26-29 and 31-34 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 3,584,850 issued to Brandvold (hereinafter "Brandvold");

(2) the rejection of claims 1-25 under 35 U.S.C. § 103(a) as being obvious over U.S. Patent No. 3,488,700 issued to Iken et al. (hereinafter "Iken") in view of U.S. Patent No. 4,255,115 issued to Graat et al. (hereinafter "Graat");

(3) the rejection of claims 1-25 under 35 U.S.C. § 103(a) as being obvious over Brandvold in view of Graat;

(4) the rejection of claims 1-25 under 35 U.S.C. § 103(a) as being obvious over Brandvold in view of U.S. Patent No. 5,413,476 issued to Baukal, Jr. et al. (hereinafter "Baukal").

ARGUMENT

I. THE BOARD IS URGED TO REVERSE THE FIRST GROUND OF REJECTION

The claims within the first ground of rejection will be separately argued in the following groups:

Group A – claims 26-29

Group B – claims 31-34

A. Claims 26-29 are not Anticipated by Brandvold

Brandvold discloses two distinctly different types of mineral kilns. FIGS. 1-4 are directed to a conventional long kiln in which the material being processed is introduced into the rotary vessel where it moves down the length of the kiln and is subjected to increasing kiln gas temperatures. In the upper portion of the rotary vessel where the kiln gas temperatures are the lowest, the mineral first undergoes a drying/preheating process and thereafter moves down the rotary vessel until the temperature is raised to calcining temperature. In this length of the rotary vessel, the mineral undergoes a calcining process (releasing carbon dioxide). The in-process mineral finally moves down the rotary vessel into an area where gas temperatures are the hottest, the clinkering or reaction zone at the fired lower end of the rotary vessel. In contrast, FIG. 5 of Brandvold is directed to a preheater/precalcining kiln. In a preheater/precalciner kiln, the raw mineral is heated to calcining temperatures in a stationary precalciner vessel before it drops into a heated rotary vessel for the higher temperature clinkering reactions.

Anticipation exists only if all the elements of the claimed invention are present in a product or process disclosed, expressly or inherently, in a single prior art reference. *Hazeltine Corp. v. RCA Corp.*, 468 U.S. 1228 (1984). A proper rejection under §102 has not been established in regard to claims 26-29 based on Brandvold because the Examiner is improperly picking and choosing between the two different types of kilns disclosed in Brandvold when formulating his rejection using the air inlet opening from Brandvold's long kiln and the preheather/precalcing assembly 38 of Brandvold's preheater/precalcing kiln.

Indeed, as shown in FIGS. 1-4, Brandvold's conventional long kiln includes an air inlet opening 24e positioned between the ends of the rotary kiln 14, but no preheater/precalcining assembly. As shown in FIG. 5, Brandvold's preheater/precalcing kiln includes a

preheater/precalciner assembly 38, but no air inlet opening positioned between the ends of the rotary vessel. As such, the issue relating to the rejection of claims 26-29 effectively boils down to this: *the Examiner has not been able to point to kiln within Brandvold that includes* ***both*** *an air inlet opening positioned between the ends of the rotary kiln* ***and*** *a preheater/precalciner assembly.* Instead, the Examiner has taken the air inlet opening 24e out of Brandvold's long kiln and placed it in Brandvold's preheater/precalciner kiln. ***In other words, the Examiner is picking and choosing between the long kiln and the preheating/precalcining kiln of Brandvold in an effort to find all of the elements necessary to support the Examiner's rejection.*** In particular, the long kiln of FIGS. 1-4 doesn't include a "preheater or precalcining assembly 38, 40". The preheating/precalcining kiln of FIG. 5 of Brandvold does not have an air inlet opening 24e positioned between the upper end and lower end of the rotary vessel – a point conceded by the Examiner in his Response to Arguments in the 2/6/06 Final Office Action on page 10, line 2 ("[h]owever, FIGS. 1 and 4 show such a conventional feature").

As such, the record clearly establishes that the Examiner picks and chooses a "preheater/precalcining assembly" from Brandvold's preheating/precalcining kiln of FIG. 5 and an air inlet opening located between the ends of the rotary vessel from Brandvold's conventional long kiln of FIGS. 1-4. Such picking and choosing between the two different types of kilns is improper. "When a claimed invention is not identically disclosed in a reference, and instead requires picking and choosing among a number of different options disclosed by the reference, the reference does not anticipate." *Mendenhall v. Astec Industries, Inc.*, 13 U.S.P.Q.2d 1913, 1928 (Tenn. 1988), *aff'd* 13 U.S.P.Q.2d 1956 (Fed Cir. 1989).

Yet the Examiner has been picking and choosing from among Brandvold's kilns for some time. See, e.g., the 6/15/05 Office Action, page 2. In response to Applicants arguments citing authority for the impropriety of such picking and choosing, the Examiner again sustained the rejection on the legally flawed notion that he can ignore legal precedent since the Applicants can choose to amend their claims (see 2/8/06 Final Office Action page 10, lines 9-12 "[t]he applicant also argued that the examiner has improperly picked and chosen various elements from Brandvold patent against the broad claims presented. This line of argument is not persuasive because the applicant has absolute right to amend the broad claims in order to structurally define the prior art references.") Respectfully, this is a complete misapplication of the law. The Examiner offered no

legal basis for his assertion that he can ignore the teachings of *Mendenhall* simply because he is of the belief that the Applicants have a right to amend their claims. When Appellants reiterated their arguments in the first appeal brief, the Examiner again failed to offer any legal basis for ignoring the teachings of *Mendenhall*. Instead, the Examiner reopened prosecution and issued another rejection of claims 26-29. Once again, the rejection was based on elements picked and chosen from the different kilns discussed by Brandvold and again the Examiner offered no legal basis for ignoring legal precedent. (See 11/29/06 Office Action page 3, lines 5-10.) Rather than responding to Appellants' reasonable legal arguments, the Examiner has refused to apply the proper legal standard and has significantly delayed resolution of this matter.

In summary, the record clearly establishes that the Examiner has picked and chosen from the two different types of kilns disclosed in Brandvold in the formation of his rejection. The record also clearly establishes that despite his acknowledgement of the same, the Examiner refuses to apply the proper legal standard established in *Mendenhall*. In doing so, the Examiner is maintaining a rejection that is completely contrary to relevant case law. For this reason, the Examiner has not established a proper § 102 rejection with regard to Appellants' claims 26-29. The rejection of independent claim 26, and claims 27-29 depending either directly or indirectly therefrom, should be reversed.

B. Claims 31-34 are not Anticipated by Brandvold

On page 3 of the 2/8/06 Final Office Action, the Examiner asserted:

> For claim 31, a mineral feed assembly 22a is operable to heat lime mineral and thereafter advance the lime mineral into the upper end of the rotary vessel 18. It is noted that the incoming mineral passes inlet chute 20d and is indirectly heated by the existing hot flue gas 28 in vessel 22a.

The Examiner further noted in the Response to Arguments section on page 10 of the same Office Action:

> ...regarding claims 31-33, the applicant argued that the examiner's rejection under Brandvold is not supported by the art. The examiner disagrees because the mineral feed assembly 22a, 20d is operable to heat incoming lime mineral by existing hot exhaust gases thru heat conduction and radiation.

Hence, by the Examiner's own admission, Brandvold does not disclose a feed assembly that is operable to "heat lime mineral *by contact with a kiln gas stream advancing therethrough.*" To the

contrary, by the Examiner's own admission, the kiln of Brandvold is different since "mineral passes through the inlet chute 20d and is ***indirectly heated*** by the exiting hot flue gas 28 in vessel 22a" through "heat conduction" and "radiation". In other words, the lime mineral is not in contact with the kiln gas stream.

Despite these admissions, on page 3 of the 11/29/06 Office Action, the Examiner changed his position and now rejects claims 31-34 under the notion that Brandvold's preheater or precalcining assembly 38, 40 reads on the claimed mineral feed assembly:

> For claim 31, a mineral feed assembly 38, 40, 20d is operable to heat lime mineral and thereafter advance the lime mineral into the upper end of the rotary vessel 18.

Appellants do not dispute that Brandvold's preheater or precalcining assembly 38, 40 is operable to heat lime mineral prior to introduction into the rotary kiln – in fact, that is the very nature of such a structure. ***The problem is such a structure is included in Brandvold's preheater/precalciner kiln of FIG. 5 which does not include an air inlet between the ends of the rotary vessel (this feature being found only in the conventional long kiln of FIGS. 1-4).*** In other words, while it is noted with appreciation that the Examiner now finally realizes that none of the structures of Brandvold's conventional long kiln of FIGS. 1-4 is readable on the claimed mineral feed assembly, the Examiner has now created a different problem since the preheater/precaliner kiln of FIG. 5 on which he now relies for such a structure is missing another element – an air inlet located between the ends of the rotary vessel. In essence, the Examiner has again resorted to improper picking and choosing between the different types of kilns disclosed in Brandvold. As such, the rejection of claims 31-34 is not supported by the art and should be reversed.

II. THE BOARD IS URGED TO REVERSE THE SECOND GROUND OF REJECTION

The claims within the second ground of rejection will be separately argued in the following groups:

Group A – claims 1, 2, 4-9, and 11-14

Group B – claims 3 and 10

Group C – claim 15

Group D – claims 16-18

Group E – claims 19, 21, and 23-25

Group F – claim 20

Group G – claim 22

A. Claims 1, 2, 4-9, and 11-14 are not Obvious over Iken and Graat

The § 103 rejection of claims 1, 2, 4-9, and 11-14 is improper and should be overruled for at least the following reasons:

(i) there is no legally sufficient reason to combine the references, and

(ii) the combination does not arrive at the invention.

(i) There is No Legally Sufficient Reason to Combine the References

In a recent decision, the United States Supreme Court clarified the test for obviousness. See *KSR Int'l. Co. v. Teleflex, Inc. et al.*, 127 S.Ct. 1727 (2007). As discussed in detail below, when the Court's test is properly applied, the Section 103 rejections of the claims must be withdrawn since the Examiner did not provide the explicit analysis of obviousness required by *KSR*. Furthermore, as will also be discussed below in greater detail, Appellants assert that no such reason exists because the proposed combination would render the device of Iken inoperable for one of its intended purposes. Thus, Iken and Graat teach away from the proposed combination and cannot support a finding of obviousness.

The Supreme Court in *KSR* reaffirmed that certain principles govern the analysis of obviousness. One such principle is that an examiner "in formulating a rejection under 35 U.S.C. § 103(a) based upon a combination of prior art element [must] identify the reason why a person of ordinary skill in the art would have combined the prior art elements in the manner claimed." See Memorandum from Margaret A. Focarino, Deputy Commissioner for Patent Operations to Technology Center Directors (May 3, 2007) (hereinafter "Forcarino Memo") (quoting *KSR*, 127 S.Ct. at 1741). Another principle the *KSR* court emphasized is the need for the examiner to engage in an explicit analysis of obviousness; as the Court stated: "***rejections on obviousness grounds cannot be sustained by mere conclusory statements***; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *KSR*, 127 S.Ct. at 1741 (quoting In re Kahn, 441 F.3d 977, 988 (Fed. Cir. 2006) (emphasis added)).

In the case at hand, respectfully, the Examiner has provided no analysis whatsoever as to why the Examiner believes that a person of ordinary skill in the art would combine Iken and Graat. Indeed, in an apparent attempt to establish a prima facie case of obviousness in the present case, the Examiner stated on pages 4-5 of the 11/29/06 Office Action that it would have been obvious:

> [T]o modify the air/fuel stoichimetry [sic] controlling method of Iken et al to include the steps of advancing a first quantity of combustion air to create sub-stoichiometric conditions and advancing a second quantity of combustion air to create super-stoichiometric conditions as taught by Graat et al in order to improve the combustion efficiency. (emphasis added)

No further analysis was offered by the Examiner as to why he thought so. In other words, the entirety of his analysis is "to improve the combustion efficiency". That's it – the analysis contains nothing else. Respectfully, this is nothing more than the very type of unsupported, conclusory statement condemned by the *KSR* Court. Indeed, as discussed above, the *KSR* Court emphasized the need for the examiner to engage in an explicit analysis of obviousness, and warned that rejections on obviousness grounds cannot be sustained by mere conclusory statements. There can be no finer example of the use of a mere conclusory statement than the instant rejection.

The Examiner also failed to provide any evidence validating his proposed reason to combine. For example, the Examiner did not offer evidence of "demands known to the design community or present in the market place." See Forcarino Memo (quoting *KSR*, 127 S.Ct. at 1740). Nor did the Examiner discuss how the "background knowledge possessed by a person of ordinary skill in the art" led the Examiner to conclude there was a reason to combine. See id. Thus, the Examiner has failed to engage in the explicit analysis required by *KSR*; as such, the Examiner's obviousness rejection of claims1, 2, 4-9, and 11-14 is unsustainable.

Appellants further assert that not only has the Examiner failed to engage in the explicit analysis demanded by *KSR*, no proper analysis could be done to support a finding of obviousness since the prior art actually teaches away from the proposed combination of Iken and Graat. The *KSR* Court emphasized the "principle that when the prior art teaches away from combining certain known elements, discovery of a successful means of combining them is more likely to be nonobvious." *KSR*, 127 S.Ct. at 1740 (citing U.S. v. Adams, 383 U.S. 39, 51-52 (1966)). According to the Federal Circuit, the prior art effectively teaches away when an examiner's proposed modification of prior art renders the prior art invention "inoperable for its intended purpose." In re Gordon, 733 F.2d 900, 902 (Fed. Cir. 1984).

No one skilled in the art would modify the kiln of Iken to include the air supply of Graat ***since Graat introduces cold air directly into the flame***. Indeed, Iken introduces secondary air into the kiln and directs the air into contact with the hot mineral in the kiln for the purposes of heating such air prior to introduction of the air into the flame. (See Iken, col 1, lns. 52-57.) This heated secondary air then mixes with another air stream for the purpose of increasing the air temperature "prior to coming into contact with flame." Iken, col. 3, lns. 11-15. See id., col. 3, lns. 4-20 ("[T]he now hotter and thus also more tenacious oxygen stream is well suited for flame formation..."). Conversely, Graat introduces a "a stream of cold air ... in a plane E extending substantially perpendicularly to axis A, within a portion of the flame cone which, by turbulence, residence time and temperature of the component(s) supplied, provides in the flame for sufficient heating and/or auxiliary combustion while avoiding as far as possible the production of harmful substances." Graat, col. 2, lns. 4-12. In other words, Graat must introduce a ***cold*** air stream ***directly*** into the flame in order to produce its desired results, whereas Iken requires that the secondary air be preheated by the mineral bed prior to introduction into the flame in order to produce its desired results. ***No one skilled in the art would introduce a cold air stream directly into the flame of Iken's kiln to supplement the already present secondary air supply since the very purpose of Iken's existing secondary air supply is to heat the air prior to it coming into contact with the flame.*** If one skilled in the art wanted more secondary air as the Examiner believes, he or she would simply increase the amount of secondary air 7, 9 being utilized since such air would be heated prior to introduction into the flame in a manner consistent with the teachings of Iken. One skilled in the art certainly would not go to the effort and expense to modify Iken's kiln with Graat's air introduction mechanism since it would be merely redundant hardware and would actually inject cold air into the flame in complete contradiction to Iken's teachings.

Because the Examiner has not engaged in an explicit analysis of obviousness and offered only a conclusory, unsupported statement as the legally required reason to combine Iken and Graat, and in light of the overwhelming reasons against such a combination, it appears that the Examiner is using the Applicant's application as a roadmap in developing his rejection. That is, the Examiner appears to be relying on hindsight reasoning to support his rejection of the claims under 35 U.S.C. § 103(a). The use of such hindsight reconstruction is not proper. The Supreme Court has warned that fact finders "must be cautious of arguments reliant upon *ex post* reasoning" and instructed them to

"guard against slipping into the use of hindsight." *KSR*, 127 S.Ct. at 1742 (citing Graham v. John Deere, 383 U.S. 1, 36 (1966)). The Patent Office "may not, because it may doubt that the invention is patentable, resort to speculation, unfounded assumptions or hindsight reconstruction" to make up for deficiencies in its basis for a rejection under 35 U.S.C. § 103. In re Rice, 481 F.2d 1316, 178 USPQ 478, 479 (CCPA 1973).

(ii) The Proposed Combination Does Not Arrive at the Invention

Even if, for argument's sake, that the Examiner had offered a legally sufficient reason to combine Iken and Graat, such a combination would not arrive at the invention of claims 1, 2, 4-9, and 11-14. For example, as conceded by the Examiner in the 11/29/06 Office Action, Iken does not disclose creating sub-stoichiometric conditions in the lower end of the rotary vessel. Instead, he relies on Graat for such a teaching and states "combustion takes place with an excess of oxygen (i.e. excess of first combustion air which creates sub-stoichiometric conditions, col. 4, lines 60-64). ***On its face, this passage alone demonstrates why the rejection must be overturned – excess air, by definition, does not create sub-stoichiometric conditions, but rather creates super-stoichiometric conditions. Sub-stoichiometric conditions occur when less than stoichiometric amounts of air are present, not excess amounts.*** A brief review of the passage cited by the Examiner (i.e., col. 4, lines 60-64 of Graat) supports the notion that Gratt's burner does not operate at sub-stoichiometric conditions ("combustion takes place either under stoichiometric conditions or with an excess of oxygen"). In short, neither Graat nor Iken disclose the use of a sub-stoichiometric air-to-fuel ratio in the lower end of the rotary vessel. As a result, the combination of Iken and Graat cannot arrive at the invention of claims 1, 2, 4-9, and 11-14 and do not support a rejection under §103.

(iii) Conclusion regarding claims 1, 2, 4-9, and 11-14

Based on the above, the Examiner has not established a proper §103 rejection with regard to Appellants' claims 1, 2, 4-9, and 11-14. As such, the rejection of claims 1, 4-8, and 11-14 should be reversed.

B. Claims 3 and 10 are not Obvious over Iken and Graat

A proper rejection under § 103 has not been established in regard to claims 3 and 10 since the Examiner has not shown how the claimed ranges are matters of mere design choice. In particular, the Examiner bases his rejection on page 5 of the 11/29/06 Office Action on the notion that the claimed ranges are obvious "since applicant has not disclosed that the claimed combustion air mass flow rate range solves any stated problem in a new or unexpected way or is for any particular purpose which is unobvious to on of ordinary skill in the art." It is well established that an examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. Ex parte Clapp, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985). Not only is the Examiner's assertion a legally insufficient attempt to shift the burden of proving non-obviousness to the Applicant prior to first establishing a proper case of obvious, ***but the Examiner is completely wrong on the state of the record of the subject prosecution***. In fact, Appellants' specification, numerous Responses to Office Actions, and the first Appeal Brief have clearly established where the claimed ranges solve a stated problem in a new or unexpected way. Take for example Appellants' response to the 6/3/04 Office Action which reiterates relevant sections of Appellants' specification:

> ... at the time of Applicants' invention, it was commonly believed that injections of unheated air into the cement process downstream of the cooler and the resulting displacement of air from the cooler will result in unacceptable loss of heat recovery. On closer examination by Applicants, calculations revealed that such loss of heat recovery is minimal, especially in view of the benefits of mixing the process gases in high temperature zones. Calculations show that if 10% of the theoretical combustion air is introduced with high energy into the rotary kiln, the displacement of a corresponding mass of preheated air would result in a reduction of the heat recovery from the cooler of less than 2% of the total energy input. The potential gain in process efficiency due to elimination of stratification can more than offset this heat loss. Moreover, by use of such a mixing air substitution scheme, the primary combustion zone at the lower end of the rotary vessel can be operated at a sub-stoichiometric air-to-fuel ratio thereby creating an environment that favorably destroys NO_X produced in the high temperature rotary kiln and pass through the precalciner/preheater.

In other words, the record clearly indicates that such ranges do, in fact, establish that such ranges are not mere design choices. ***The mere fact that the Examiner has heretofore chosen to ignore such portions of the record does not obviate their presence. Indeed, the Examiner has never rebutted the assertions made in the above-cited passage (or the corresponding portions of the specification) in an effort to cement his obvious rejection, but rather he has merely continued to insist that such passages don't exist in the record.*** As a result, the Examiner has failed to meet his burden of establishing a case of obviousness.

Because the Examiner has not established a prima facie case of obviousness in regard to Appellants' claims 3 and 10, the Board is urged to reverse the rejection.

C. Claim 15 is not Obvious over Iken and Graat

A proper rejection under §103 has not been established in regard to claim 15 since claim 15 is dependent on claim 14 and, as discussed herein, a proper rejection of claim 14 has not been established. Moreover, a proper rejection has not been established in regard to claim 15 for similar reasons to as above in regard to claims 3 and 10. Namely, Appellants have established on the record why the claimed ranges are not matters of design choice and the Examiner has failed to rebut the same. As such, the rejection of claim 15 should be reversed.

D. Claims 16-18 are not Obvious over Iken and Gratt

A proper rejection under §103 has not been established in regard to claims 16-18 since claims 16-18 are dependent on claim 14 and, as discussed herein, a proper rejection of claim 14 has not been established. Moreover, a proper rejection has not been established in regard to claims 16-18 since the Examiner has not shown where either Iken or Gratt discloses an air nozzle extending into the rotary vessel through an opening in the wall of the rotary vessel with such a nozzle being used to create super-stoichiometric conditions in the mid-portion of the rotary vessel. As such, the rejection of claims 16-18 should be reversed.

E. Claims 19, 21, and 23-25 are not Obvious over Iken and Graat

The §103 rejection of claims 19, 21, and 23-25 is improper and should be reversed for at least the following reasons:

(i) there is no legally sufficient reason to combine the references, and

(ii) the combination does not arrive at the invention.

(i) There is No Legally Sufficient Reason to Combine the References

The arguments put forth above in section II.A(i) relating to the lack of a legally sufficient reason to combine the references are relevant to the rejection of claims 19, 21, and 23-25 and are incorporated in their entirety into Appellants' argument relating to claims 19, 21, and 23-25.

(ii) The Proposed Combination Does Not Arrive at the Invention

Even if, for argument's sake, that the Examiner had offered a legally sufficient reason to combine Iken and Graat, such a combination would not arrive at the invention of claims 19, 21, and 23-25. For example, Iken does not disclose a preheating/precalcining assembly. Incorporating a burner 3 and the guide nozzles 12 from Graat's hot gas generator, as proposed by the Examiner, would not cure such a deficiency.

(iii) Conclusion regarding claims 19, 21, and 23-25

Based on the above, the Examiner has not established a proper § 103 rejection with regard to Appellants' claims 19, 21, and 23-25. As such, the rejection of claims 19, 21, and 23-25 should be reversed.

F. Claim 20 is not Obvious over Iken and Graat

A proper rejection under § 103 has not been established in regard to claim 20 since claim 20 is dependent on claim 19 and, as discussed herein, a proper rejection of claim 19 has not been established. The arguments put forth above in section II.A(ii) relating to the fact that the proposed combination of Iken and Graat does not arrive at the invention are relevant to the rejection of claim 20 and are incorporated in their entirety into Appellants' argument relating to claim 20. As such, the rejection of claim 20 should be reversed.

G. Claim 22 is not Obvious over Iken and Graat

A proper rejection under §103 has not been established in regard to claim 22 since claim 22 is dependent on claim 19 and, as discussed herein, a proper rejection of claim 19 has not been established. Moreover, a proper rejection has not been established in regard to claim 22 for similar reasons to as above in regard to claims 3 and 10. Namely, Appellants have established on the record why the claimed ranges are not matters of design choice and the Examiner has failed to rebut the same. As such, the rejection of claim 22 should be reversed.

III. THE BOARD IS URGED TO REVERSE THE THIRD GROUND OF REJECTION

The claims within the third ground of rejection will be separately argued in the following groups:

Group A – claims 1, 2, 4-9, and 11-14

Group B – claims 3 and 10

Group C – claim 15

Group D – claims 16-18

Group E – claims 19, 21, and 23-25

Group F – claim 20

Group G – claim 22

A. Claims 1, 2, 4-9, and 11-14 are not Obvious over Brandvold and Graat

The § 103 rejection of claims 1, 2, 4-9, and 11-14 is improper and should be overruled for at least the following reasons:

(i) there is no legally sufficient reason to combine the references, and

(ii) the combination does not arrive at the invention.

(i) There is No Legally Sufficient Reason to Combine the References

The legal authorities put forth above in regard to the §103 rejections based on Brandvold and Graat are fully incorporated into this section.

In an apparent attempt to establish a case of obviousness in the present case, the Examiner stated on page 6 of the 11/29/06 Office Action that it would have been obvious:

> [T]o modify the air/fuel stoichimetry [sic] controlling method of Brandvold to include the steps of advancing a first quantity of combustion air to create sub-stoichiometric conditions and advancing a second quantity of combustion air to create super-stoichiometric conditions as taught by Graat et al or Baukal in order to improve the combustion efficiency. (emphasis added).

Again, in lieu of a reasoned, explicit analysis that satisfies the relevant legal standards, including those recently reiterated by the Supreme Court in *KSR*, the Examiner has merely floated out an unsupported, conclusory statement regarding the reason to combine the teachings of Brandvold and Graat in such a manner without any evidence or analysis to support it. Such an unsupported, conclusory statement is not a legally sufficient substitution for the explicit analysis

required by the Supreme Court. The Examiner has failed to point to any section of Brandvold, Graat, or any other source of record wherein such a reason to combine is provided.

Furthermore, not only has the Examiner not conducted a legally sufficient analysis to identify a reason to combine the teachings of Brandvold and Graat, it is believed that no such reason exists. Even if, for argument's sake, one of ordinary skill in the art had the general desire "to improve the combustion efficiency" of Brandvold's kiln, the Examiner has failed to show how such a general desire would lead to the specific combination of the combustion process of Graat with Brandvold's kiln.

Appellants further assert that not only has the Examiner failed to engage in the explicit analysis demanded by *KSR*, no proper analysis could be done to support a finding of obviousness since the prior art actually teaches away from the proposed combination of Brandvold and Graat. No one skilled in the art would combine Graat and Brandvold ***because the combustion system of Graat will not function in the kiln of Brandvold as asserted by the Examiner.*** Indeed, as discussed with regard to the §103 rejections based on Iken and Graat, ***the cold combustion air of Graat must be introduced directly into the flame and NOT at some location tens, if not hundreds, of feet away as proposed by the Examiner.*** (See, e.g., Graat, col 2, lns 4-12 - "[I]ntroducing a stream of cold air ... in a plane E extending substantially perpendicularly to axis A, within a portion of the flame cone which, by turbulence, residence time and temperature of the component(s) supplied, provides in the flame for sufficient heating and/or auxiliary combustion while avoiding as far as possible the production of harmful substances." (emphasis added)). As pointed out at col. 1, lns. 8-13 of Brandvold, the nominal size of a rotary kiln is ***450 feet*** with the air inlet 24e located at the far end of the rotary kiln relative to the flame. ***In other words, air introduced through the air inlet 24e of Brandvold's kiln is not directed into the flame of the kiln's burner, but rather is introduced at a location tens, if not hundreds, of feet away from the flame.*** Graat's flame system will not function in such conditions. As such, no one skilled in the art would be motivated to make such a combination since such a combination simply would not work. To do so would render Graat's system unable to perform its intended function and destroy the whole intent, purpose, and function of the Graat's system. As established above, when an obviousness rejection is based upon a combination or modification of a reference that renders the invention disclosed in that reference

inoperable for its intended purpose, such a proposed combination or modification is not proper and a prima facie case of obviousness cannot be made.

Because the Examiner has not engaged in an explicit analysis of obviousness and offered only a conclusory, unsupported statement as the legally required reason to combine Brandvold and Graat, and in light of the significant arguments against such a combination, it appears that the Examiner is again using the Applicant's application as a roadmap in developing his rejection. That is, the Examiner appears to be using hindsight reconstruction to support his rejection of the claims under 35 U.S.C. §103. Such use of hindsight reconstruction is not proper.

(ii) The Proposed Combination Does Not Arrive at the Invention

Even if, for argument's sake, that the Examiner had offered a legally sufficient reason to combine Brandvold and Graat, such a combination would not arrive at the invention of claims 1, 2, 4-9, and 11-14. For example, as conceded by the Examiner in the 11/29/06 Office Action, Brandvold does not disclose creating sub-stoichiometric conditions in the lower end of the rotary vessel. Instead, as before, he relies on Graat for such a teaching and states "combustion takes place with an excess of oxygen (i.e. excess of first combustion air which creates sub-stoichiometric conditions, col. 4, lines 60-64)". ***As pointed out above, this passage alone demonstrates why the rejection must be overturned – excess air, by definition, does not create sub-stoichiometric conditions, but rather creates super-stoichiometric conditions. Sub-stoichiometric conditions occur when less than stoichiometric amounts of air are present, not excess amounts.*** In short, neither Graat nor Brandvold disclose the use of a sub-stoichiometric air-to-fuel ratio in the lower end of the rotary vessel. As a result, the combination of Brandvold and Graat cannot arrive at the invention of claims 1, 2, 4-9, and 11-14 and do not support a rejection under §103.

(iii) Conclusion regarding claims 1, 2, 4-9, and 11-14

Based on the above, the Examiner has not established a proper § 103 rejection with regard to Appellants' claims 1, 2, 4-9, and 11-14. As such, the rejection of claims 1, 2, 4-9, and 11-14 should be reversed.

B. Claims 3 and 10 are not Obvious over Brandvold and Graat

A proper rejection under §103 has not been established in regard to claims 3 and 10 for similar reasons to as above in regard to the §103 rejections of claims 3 and 10 based on Iken and Graat, the entirety of such arguments being incorporated into this section. Namely, Appellants have established on the record why the claimed ranges are not matters of design choice and the Examiner has failed to rebut the same. As such, the rejection of claims 3 and 10 should be reversed.

C. Claim 15 is not Obvious over Brandvold and Graat

A proper rejection under §103 has not been established in regard to claim 15 since claim 15 is dependent on claim 14 and, as discussed herein, a proper rejection of claim 14 has not been established. Moreover, a proper rejection has not been established in regard to claim 15 for similar reasons to as above in regard to claims 3 and 10. Namely, Appellants have established on the record why the claimed ranges are not matters of design choice and the Examiner has failed to rebut the same. As such, the rejection of claim 15 should be reversed.

D. Claims 16-18 are not Obvious over Brandvold and Gratt

A proper rejection under §103 has not been established in regard to claims 16-18 since claims 16-18 are dependent on claim 14 and, as discussed herein, a proper rejection of claim 14 has not been established. Moreover, a proper rejection has not been established in regard to claims 16-18 since the Examiner has not shown where either Brandvold or Gratt discloses an air nozzle extending into the rotary vessel through an opening in the wall of the rotary vessel with such a nozzle being used to create super-stoichiometric conditions in the mid-portion of the rotary vessel. As such, the rejection of claims 16-18 should be reversed.

E. Claim 19, 21, & 23-25 are not Obvious over Brandvold and Graat

The §103 rejection of claims 19, 21, and 23-25 is improper and should be reversed for at least the following reasons:

(i) there is no legally sufficient reason to combine the references, and

(ii) the combination does not arrive at the invention.

(i) There is No Legally Sufficient Reason to Combine the References

The arguments put forth above in section III.A(i) relating to the lack of a legally sufficient reason to combine are relevant to the rejection of claims 19, 21, and 23-25 and are incorporated in their entirety into Appellants' argument relating to claims 19, 21, and 23-25.

(ii) The Proposed Combination Does Not Arrive at the Invention

Even if, for argument's sake, that the Examiner had offered a legally sufficient reason to combine Brandvold and Graat, such a combination would not arrive at the invention of claims 19, 21, and 23-25. In the above arguments relating to the §102 and §103 rejections involving Brandvold, Appellants have traversed the rejections based on Brandvold with a number of structural and process differences, with such distinctions not being repeated in this section for purposes of brevity. Graat does not cure such deficiencies. Moreover, in the formation of the §103 rejection based on Brandvold and Graat, the Examiner has again resorted to the improper picking and choosing from the different kilns disclosed in Brandvold. As a result of this, a prima facie case of obviousness has not been established in regard to claims 19, 21, and 23-25 since the combination does not arrive at the invention.

(iii) Conclusion regarding claims 19, 21, and 23-25

Based on the above, the Examiner has not established a proper § 103 rejection with regard to Appellants' claims 19, 21, and 23-25. As such, the rejection of claims 19, 21, and 23-25 should be reversed.

F. Claim 20 is not Obvious over Brandvold and Graat

A proper rejection under § 103 has not been established in regard to claim 20 since claim 20 is dependent on claim 19 and, as discussed herein, a proper rejection of claim 19 has not been established. The arguments put forth above in section III.A(ii) relating to the fact that the proposed combination of Brandvold and Graat does not arrive at the invention are relevant to the rejection of claim 20 and are incorporated in their entirety into Appellants' argument relating to claim 20. As such, the rejection of claim 20 should be reversed.

G. Claim 22 is not Obvious over Brandvold and Graat

A proper rejection under § 103 has not been established in regard to claim 22 since claim 22 is dependent on claim 19 and, as discussed herein, a proper rejection of claim 19 has not been established. Moreover, a proper rejection has not been established in regard to claim 22 for similar reasons to as above in regard to claims 3 and 10. Namely, Appellants have established on the record why the claimed ranges are not matters of design choice and the Examiner has failed to rebut the same. As such, the rejection of claim 22 should be reversed.

IV. THE BOARD IS URGED TO REVERSE THE FOURTH GROUND OF REJECTION

The claims within the fourth ground of rejection will be separately argued in the following groups:

Group A – claims 1, 2, 4-9, and 11-14

Group B – claims 3 and 10

Group C – claim 15

Group D – claims 16-18

Group E – claims 19, 21, and 23-25

Group F – claim 20

Group G – claim 22

A. Claims 1, 2, 4-9, and 11-14 are not Obvious over Brandvold and Baukal

The § 103 rejection of claims 1, 2, 4-9, and 11-14 is improper and should be overruled for at least the following reasons:

(i) there is no legally sufficient reason to combine the references, and

(ii) the combination does not arrive at the invention.

(i) There is No Legally Sufficient Reason to Combine the References

The legal authorities put forth above in regard to the § 103 rejections based on Iken and Graat and the §103 rejections based on Brandvold and Graat are fully incorporated into this section.

In an apparent attempt to establish a case of obviousness in the present case, the Examiner stated on page 6 of the 11/29/06 Office Action that it would have been obvious:

> [T]o modify the air/fuel stoichimetry [sic] controlling method of Brandvold to include the steps of advancing a first quantity of combustion air to create sub-stoichiometric conditions and advancing a second quantity of combustion air to create super-stoichiometric conditions as taught by Graat et al or Baukal in order to improve the combustion efficiency." (emphasis added)

Again, in lieu of a reasoned, explicit analysis that satisfies the relevant legal standards, including those recently reiterated by the Supreme Court in *KSR*, the Examiner has merely floated out an unsupported, conclusory statement regarding the reason to combine the teachings of Brandvold and Baukel in such a manner without any evidence or analysis to support it. Such an unsupported, conclusory statement is not a legally sufficient substitution for the explicit analysis required by the Supreme Court. The Examiner has failed to point to any section of Brandvold, Baukel, or any other source of record wherein such a reason to combine is provided.

Furthermore, not only has the Examiner not conducted a legally sufficient analysis to identify a reason to combine the teachings of Brandvold and Baukel, it is believed that no such reason exists. Even if, for argument's sake, one of ordinary skill in the art had the general desire "to improve the combustion efficiency" of Brandvold's kiln, the Examiner has failed to show how such a general desire would lead to the specific combination of the combustion process of Baukel with Brandvold's kiln.

Appellants further assert that not only has the Examiner failed to engage in the explicit analysis demanded by *KSR*, no proper analysis could be done to support a finding of obviousness since the prior art actually teaches away from the proposed combination of Brandvold and Baukel. No one skilled in the art would combine Baukal and Brandvold because ***as discussed in detail throughout Baukal, the combustion system of Baukal will not function in the kiln of Brandvold as purported by the Examiner. Indeed, the secondary oxygen of Baukal must be introduced into the flame NOT at some location tens, if not hundreds, of feet away as proposed by the Examiner.*** (See, e.g., Baukal, col. 4, lns 36-46 ("The location of oxygen introduction into the flame is critical, and test furnace experiments later described showed that the oxygen must be introduced directly into the visible flame at a distance x, where x is measured from the burner discharge point in an axial direction, such that x/L is at least about 0.3, L being the total length of the visible flame produced by the burner as measured from the burner discharge point to the tip of the flame. The upper limit of x/L is about 0.8, beyond which NO_X formation begins to increase above that of conventional air-based burners." (emphasis added))). As discussed above, the nominal size of a rotary kiln is ***450 feet*** with

the air inlet 24e located at the far end of the kiln relative to the flame. See Brandvold, col. 1, lns. 8-13. ***In other words, air introduced through the air inlet 24e of Brandvold's kiln is not directed into the visible flame of the kiln's burner, but rather is introduced at a location tens, if not hundreds, of feet away from the flame.*** Baukal's flame system will not function in such conditions. As such, no one skilled in the art would be motivated to make such a combination since it simply would not work. To do so would render Baukal's system unable to perform its intended function and destroy the whole intent, purpose, and function of the Baukal's system. As established above, when an obviousness rejection is based upon a combination or modification of a reference that renders the invention disclosed in that reference inoperable for its intended purpose, such a proposed combination or modification is not proper and a prima facie case of obviousness cannot be made.

Because the Examiner has not engaged in an explicit analysis of obviousness and offered only a conclusory, unsupported statement as the legally required reason to combine Brandvold and Baukal, and in light of the significant arguments against such a combination, it appears that the Examiner is again using the Applicant's application as a roadmap in developing his rejection. That is, the Examiner appears to be using hindsight reconstruction to support his rejection of the claims under 35 U.S.C. § 103. Such use of hindsight reconstruction is not proper.

(ii) The Proposed Combination Does Not Arrive at the Invention

Even if, for argument's sake, that the Examiner had offered a legally sufficient reason to combine Brandvold and Baukel, such a combination would not arrive at the invention of claims 1, 2, 4-9, and 11-14. For example, as conceded by the Examiner in the 11/29/06 Office Action, Brandvold does not disclose creating sub-stoichiometric conditions in the lower end of the rotary vessel. Instead, he relies on Baukel for such a teaching and states "Baukal illustrated the importance and the desire to have two stage combustions, e.g. sub-stoichiometric and supper-stoichiometric [sic] combustion in order to maximize the efficiency fuel efficiency and reduce pollutants". Respectfully, Appellants are quite surprised to see this line of thinking remain at issue in this prosecution. Indeed, in multiple previous office actions, the Examiner rejected Appellants claims under §102 based on the false notion that Baukal teaches the creation of sub-stoichiometric conditions. In responses to such office actions and in their previously-filed first Appeal Brief, Appellants fully briefed and demonstrated how Baukel neither expressly nor inherently teaches the creation of sub-stoichiometric

conditions, with such arguments and authorities being fully incorporated into this section of this Appeal Brief. The Examiner has never rebutted this and in effect conceded this point when he reopened prosecution and did not make a similar §102 rejections based on Baukal. Now, the Examiner is trying to reintroduce the same flawed interpretation of Baukal while making the present §103 rejection based on Brandvold and Baukal. Respectfully, no matter how much the Examiner wishes Baukal to teach the creation of sub-stoichiometric conditions, it simply doesn't under any legally proper analysis. In short, neither Baukal nor Brandvold disclose the use of a sub-stoichiometric air-to-fuel ratio in the lower end of the rotary vessel.

Moreover, in the above arguments relating to both the § 102 and the § 103 rejections involving Brandvold, Appellants have traversed the rejections based on Brandvold with a number of structural and process differences, with such distinctions not being repeated in this section for purposes of brevity. Baukal does not cure such deficiencies. Further, in the formation of the §103 rejection based on Brandvold and Baukal, the Examiner has again resorted to the improper picking and choosing from the different kilns disclosed in Brandvold. As a result of this, a prima facie case of obviousness has not been established in regard to claims 1, 2, 4-9, and 11-14 since the combination does not arrive at the invention.

(iii) Conclusion regarding claims 1, 2, 4-9, and 11-14

Based on the above, the Examiner has not established a proper §103 rejection with regard to Appellants' claims 1, 2, 4-9, and 11-14. As such, the rejection of claims 1, 2, 4-9, and 11-14 should be reversed.

B. Claims 3 and 10 are not Obvious over Brandvold and Baukel

A proper rejection under §103 has not been established in regard to claims 3 and 10 for similar reasons to as above in regard to the §103 rejections of claims 3 and 10 based on Iken and Graat, the entirety of such arguments being incorporated into this section. Namely, Appellants have established on the record why the claimed ranges are not matters of design choice and the Examiner has failed to rebut the same. As such, the rejection of claims 3 and 10 should be reversed.

C. Claim 15 is not Obvious over Brandvold and Baukel

A proper rejection under §103 has not been established in regard to claim 15 since claim 15 is dependent on claim 14 and, as discussed herein, a proper rejection of claim 14 has not been established. Moreover, a proper rejection has not been established in regard to claim 15 for similar reasons to as above in regard to claims 3 and 10. Namely, Appellants have established on the record why the claimed ranges are not matters of design choice and the Examiner has failed to rebut the same. As such, the rejection of claim 15 should be reversed.

D. Claims 16-18 are not Obvious over Brandvold and Baukel

A proper rejection under §103 has not been established in regard to claims 16-18 since claims 16-18 are dependent on claim 14 and, as discussed herein, a proper rejection of claim 14 has not been established. Moreover, a proper rejection has not been established in regard to claims 16-18 since the Examiner has not shown where either Brandvold or Baukel discloses an air nozzle extending into the rotary vessel through an opening in the wall of the rotary vessel with such a nozzle being used to create super-stoichiometric conditions in the mid-portion of the rotary vessel. As such, the rejection of claims 16-18 should be reversed.

E. Claim 19, 21, & 23-25 are not Obvious over Brandvold and Graat

The §103 rejection of claims 19, 21, and 23-25 is improper and should be reversed for at least the following reasons:

(i) there is no legally sufficient reason to combine the references, and

(ii) the combination does not arrive at the invention.

(i) There is No Legally Sufficient Reason to Combine the References

The arguments put forth above in section IV.A(i) relating to the lack of a legally sufficient reason to combine are relevant to the rejection of claims 19, 21, and 23-25 and are incorporated in their entirety into Appellants' argument relating to claims 19, 21, and 23-25.

(ii) The Proposed Combination Does Not Arrive at the Invention

Even if, for argument's sake, that the Examiner had offered a legally sufficient reason to combine Brandvold and Baukel, such a combination would not arrive at the invention of claims 19, 21, and 23-25. In the above arguments relating to the §102 and §103 rejections involving Brandvold, Appellants have traversed the rejections based on Brandvold with a number of structural and process differences, with such distinctions not being repeated in this section for purposes of brevity. Baukel does not cure such deficiencies. Moreover, in the formation of the §103 rejection based on Brandvold and Baukel, the Examiner has again resorted to the improper picking and choosing from the different kilns disclosed in Brandvold. As a result of this, a prima facie case of obviousness has not been established in regard to claims 19, 21, and 23-25 since the combination does not arrive at the invention.

(iii) Conclusion regarding claims 19, 21, and 23-25

Based on the above, the Examiner has not established a proper § 103 rejection with regard to Appellants' claims 19, 21, and 23-25. As such, the rejection of claims 19, 21, and 23-25 should be reversed.

F. Claim 20 is not Obvious over Brandvold and Baukel

A proper rejection under § 103 has not been established in regard to claim 20 since claim 20 is dependent on claim 19 and, as discussed herein, a proper rejection of claim 19 has not been established. The arguments put forth above in section IV.A(ii) relating to the fact that the proposed combination of Brandvold and Baukel does not arrive at the invention are relevant to the rejection of claim 20 and are incorporated in their entirety into Appellants' argument relating to claim 20. As such, the rejection of claim 20 should be reversed.

G. Claim 22 is not Obvious over Brandvold and Baukel

A proper rejection under § 103 has not been established in regard to claim 22 since claim 22 is dependent on claim 19 and, as discussed herein, a proper rejection of claim 19 has not been established. Moreover, a proper rejection has not been established in regard to claim 22 for similar reasons to as above in regard to claims 3 and 10. Namely, Appellants have established on the record

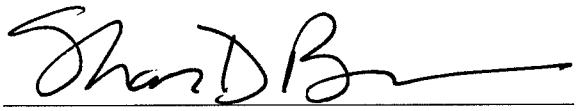
why the claimed ranges are not matters of design choice and the Examiner has failed to rebut the same. As such, the rejection of claim 22 should be reversed.

SUMMARY CONCLUSIONS

Therefore, in view of the arguments presented above, it is submitted that each of the four grounds of rejection is erroneous. The Board is thus urged to reverse these rejections. Such action is respectfully requested.

Respectfully submitted,

BARNES & THORNBURG LLP



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CLAIMS APPENDIX

1. A method of operating a mineral processing kiln having an inclined rotary vessel, the method comprising the steps of:

introducing combustion air and combustible fuel in a sub-stoichiometric ratio through a lower end of the rotary vessel, and

introducing additional combustion air through an opening in a wall of the rotary vessel at a location between the lower end of the rotary vessel and an upper end of the rotary vessel.

2. The method of claim 1, wherein:

the amount of air introduced through the lower end of the vessel and the amount of air introduced through the opening in the vessel wall define a total combustion air,

the ratio of the total combustion air and the combustible fuel introduced through the lower end of the rotary vessel defines a total air/fuel ratio, and

the step of introducing additional combustion air comprises introducing an amount of combustion air sufficient to create a super-stoichiometric total air/fuel ratio.

3. The method of claim 1, wherein the step of introducing additional combustion air comprises introducing a mass flow rate of about 1% to about 15% of the rate of mass consumption of combustion air by the mineral processing kiln.

4. The method of claim 1, wherein:

the mineral processing kiln further has an air nozzle extending into the rotary vessel through the opening in the wall of vessel, and

the step of introducing additional combustion air comprises introducing additional combustion air through the air nozzle.

5. The method of claim 4, wherein:

the air nozzle has a pressurized air source coupled thereto, and

the step of introducing additional combustion air further comprises introducing pressurized air from the pressurized air source through the nozzle.

6. The method of claim 1, wherein the step of introducing additional air comprises introducing combustion air into a reducing zone of the rotary vessel.

7. A method of operating a lime kiln having an inclined rotary vessel, the method comprising the steps of:

advancing lime mineral from an upper end of the inclined rotary vessel to a lower end of the inclined rotary vessel,

introducing combustion air and combustible fuel in a sub-stoichiometric ratio through the lower end of the rotary vessel, and

introducing additional combustion air through an opening in a wall of the rotary vessel at a location between the lower end of the rotary vessel and the upper end of the rotary vessel.

8. The method of claim 7, wherein:

the step of advancing lime mineral comprises advancing lime mineral through a calcining zone of the rotary vessel to liberate CO_2 from the lime mineral, and

the step of introducing additional combustion air comprises introducing additional air into the calcining zone of the rotary vessel.

9. The method of claim 7, wherein:

the amount of air introduced through the lower end of the vessel and the amount of air introduced through the opening in the vessel wall define a total combustion air,

the ratio of the total combustion air and the combustible fuel introduced through the lower end of the rotary vessel defines a total air/fuel ratio, and

the step of introducing additional combustion air comprises introducing an amount of combustion air sufficient to create a super-stoichiometric total air/fuel ratio.

10. The method of claim 7, wherein the step of introducing additional combustion air comprises introducing a mass flow rate of about 1% to about 15% of the rate of mass consumption of combustion air by the lime kiln.

11. The method of claim 7, wherein:

the lime kiln further has an air nozzle extending into the rotary vessel through the opening in the wall of vessel, and

the step of introducing additional combustion air comprises introducing additional combustion air through the air nozzle.

12. The method of claim 11, wherein:

the air nozzle has a pressurized air source coupled thereto, and

the step of introducing additional combustion air further comprises introducing pressurized air from the pressurized air source through the nozzle.

13. The method of claim 7, wherein the step of introducing additional air comprises introducing combustion air into a calcining zone of the rotary vessel.

14. A method of controlling the air/fuel stoichiometry in a mineral processing kiln, the method comprising the steps of:

advancing a combustible fuel into a lower end of a rotary vessel of the mineral processing kiln,

advancing a first quantity of combustion air into the lower end of the rotary vessel to create sub-stoichiometric conditions in the lower end of the rotary vessel, and

advancing a second quantity of combustion air into the rotary vessel, at a location between the lower end of the rotary vessel and an upper end of the rotary vessel, to create super-stoichiometric conditions in a mid-portion of the rotary vessel.

15. The method of claim 14, wherein the step of advancing the second quantity of combustion air comprises advancing a mass flow rate of about 1% to about 15% of the rate of mass consumption of combustion air by the mineral processing kiln.

16. The method of claim 14, wherein:

the mineral processing kiln further has an air nozzle extending into the rotary vessel through the opening in the wall of vessel, and

the step of advancing the second quantity of combustion air comprises advancing additional combustion air through the air nozzle.

17. The method of claim 16, wherein:

the air nozzle has a pressurized air source coupled thereto, and

the step of advancing the second quantity of combustion air further comprises advancing pressurized air from the pressurized air source through the nozzle.

18. The method of claim 14, wherein the step of advancing the second quantity of combustion air comprises advancing combustion air into a reducing zone of the rotary vessel.

19. A method of operating a preheater/precalciner kiln having an inclined rotary vessel, the method comprising the steps of:

advancing mineral from a preheater/precaliner assembly into an upper end of the inclined rotary vessel,

advancing mineral from the upper end of the rotary vessel to a lower end of the inclined rotary vessel,

introducing a first quantity of combustion air and combustible fuel through the lower end of the rotary vessel, and

introducing a second quantity of combustion air through an opening in a wall of the rotary vessel at a location between the lower end of the rotary vessel and the upper end of the rotary vessel.

20. The method of claim 19, wherein the first introducing step comprises introducing combustion air and combustible fuel in a sub-stoichiometric ratio.

21. The method of claim 19, wherein:

the step of advancing mineral comprises advancing mineral through a calcining zone of the rotary vessel to liberate CO_2 from the mineral, and

the step of introducing the second quantity of combustion air comprises introducing the second quantity of combustion air into the calcining zone of the rotary vessel.

22. The method of claim 19, wherein the step of introducing the second quantity of combustion air comprises introducing a mass flow rate of about 1% to about 15% of the rate of mass consumption of combustion air by the preheater/precalciner kiln.

23. The method of claim 19, wherein:

the preheater/precalciner kiln further has an air nozzle extending into the rotary vessel through the opening in the wall of vessel, and

the step of introducing the second quantity of combustion air comprises introducing additional combustion air through the air nozzle.

24. The method of claim 23, wherein:

the air nozzle has a pressurized air source coupled thereto, and

the step of introducing the second quantity of combustion air further comprises introducing pressurized air from the pressurized air source through the nozzle.

25. The method of claim 19, wherein the step of introducing the second quantity of combustion air comprises introducing combustion air into a calcining zone of the rotary vessel.

26. A mineral processing kiln, comprising:

an inclined rotary vessel having a lower end and an upper end, the rotary vessel having an air inlet opening defined therein at a location between the upper end and the lower end thereof,

a preheating/precalcining assembly positioned proximate to the upper end of the rotary vessel, the preheating/precalcining assembly comprising a stationary vessel through which (i) mineral passes prior to advancement into the rotary vessel, and (ii) a kiln gas stream passes in contact with the mineral subsequent to advancement out of the rotary vessel,

a stationary hood positioned proximate to the lower end of the rotary vessel, and

a burner positioned proximate to the lower end of the rotary vessel.

27. The mineral processing kiln of claim 26, further comprising an air nozzle extending into the rotary vessel through the air inlet opening of the wall of vessel.

28. The mineral processing kiln of claim 27, further comprising a pressurized air source coupled to the air nozzle.

29. The mineral processing kiln of claim 26, further comprising a primary combustion air source adapted to advance combustion air through the stationary hood, wherein the primary air source and the burner are operable to create sub-stoichiometric air/fuel conditions in the lower end of the rotary vessel.

31. A lime kiln, comprising:

an inclined rotary vessel having a lower end and an upper end, the rotary vessel having an air inlet opening defined therein at a location between the upper end and the lower end thereof,

a mineral feed assembly operable to heat lime mineral by contact with a kiln gas stream advancing therethrough and thereafter advance the lime mineral into the upper end of the rotary vessel,

a stationary hood positioned proximate to the lower end of the rotary vessel, and

a burner positioned proximate to the lower end of the rotary vessel.

32. The lime kiln of claim 31, further comprising an air nozzle extending into the rotary vessel through the air inlet opening of the wall of vessel.

33. The lime kiln of claim 32, further comprising a pressurized air source coupled to the air nozzle.

34. The lime kiln of claim 31, further comprising a primary combustion air source adapted to advance combustion air through the stationary hood, wherein the primary air source and the burner are operable to create sub-stoichiometric air/fuel conditions in the lower end of the rotary vessel.

EVIDENCE APPENDIX

None.

RELATED PROCEEDINGS APPENDIX

None.